UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/784,761	02/15/2001	Christopher J. Pettey	BAN:0103	2362

23669 7590 07/29/2005

HUFFMAN LAW GROUP, P.C.
1832 N. CASCADE AVE.
COLORADO SPRINGS, CO 80907-7449

EXAMINER	
ZHONG, CHAD	
ART UNIT	**PAPER NUMBER**
2152	

DATE MAILED: 07/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/784,761	PETTEY, CHRISTOPHER J.	
	Examiner	Art Unit	
	Chad Zhong	~~2154~~ 2152	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 April 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4/19/05*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

FINAL ACTION

1. This action is responsive to communications: Amendment, filed on 04/19/2005. This action has been made final.

2. Claims 1-45 are presented for examination. In amendment B, filed on 04/19/2005: claims 1, 9, 16, 23, 27, 30 are amended.

Applicant's remarks filed 4/19/2005 have been considered but are found not persuasive in view of the new grounds of rejection as necessitated by Applicant's amendment.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-22, 27-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Susnow et al. (hereinafter Susnow), US 6,751,235, in view of Cheriton et al. (hereinafter Cheriton), US 6,675,200.

4. As per claim 1, Susnow teaches a TCP-aware target adapter (Fig 3, item 360), for accelerating TCP/IP connections between a plurality of clients and a plurality of servers (Col. 3, lines 47-53), the plurality of servers being accessed via an Infiniband fabric (Col. 2, lines 55-60), the plurality of clients being accessed via a TCP/IP network (Col. 6, lines 28-45, wherein the VI is an improvement of TCP/IP, VI contains transport level reliability functions, and is able to allow faster I/O communication between network devices, other words, VI interface is a scaled down version of TCP/IP protocol for improvement

in speed and reduction of software overhead), the TCP-aware target adapter comprising:

an accelerated connection processor, configured to bridge TCP/IP transactions between the plurality of clients and the plurality of servers (Fig 3, item 330), wherein said accelerated connection processor accelerates the TCP/IP connections by prescribing remote direct memory access operations to retrieve/provide transaction data from/to the plurality of servers (Col. 4, lines 40-41); and

a target channel adapter (Fig 4, item 339, it should be noted that Host and Target channel adapter's naming convention is direction specific, host transmits data to the receiver, host channel adapter have similar purpose as target channel adapter, they both interface the host to the infiniband network, this can be supported in Col. 3, lines 42-60), coupled to said accelerated connection processor, configured to support Infiniband operations with the plurality of servers, and configured to execute said remote direct memory access operations to retrieve/provide said transaction data (Col. 4, lines 30-41; Col. 3, lines 47-55).

Susnow does not explicitly teach:

Whereby the TCP/IP connections are accelerated by offloading TCP/IP processing otherwise performed by the plurality of servers to retrieve/provide said transaction data.

In a similar system Cheriton teaches using RDMA in a TCP/IP framework (Col. 3, lines 39-57). Specifically, Cheriton discloses of the overhead caused by traditional memory copy operations (Col. 3, lines 27-31), and a method to overcome such deficiencies by using RDMA in order to improve performance. The offloading is equivalent to RDMA process wherein a remote device performs functionalities on server's behalf so server's resources are freed up. Therefore, it would have been obvious to the person ordinary skilled in the art at the time of the invention to combine teachings of Susnow and Cheriton and to have used RDMA to accelerate TCP/IP communications in Susnow's system for the performance gain achieved by using RDMA (Col. 3, lines 39-47).

5. As per claim 2, Susnow teaches the TCP-aware target adapter as recited in claim 1, wherein said accelerated connection processor comprises:

a plurality of native network ports (Col. 3, lines 30-35, wherein each native protocol has ports between transmitter and receiver), each of said native network ports communicating with the plurality of clients in a native network protocol corresponding to the plurality of clients (Col. 10, lines 25-30).

6. As per claim 3, Susnow teaches the TCP-aware target adapter as recited in claim 2, wherein said native network protocol comprises one of the following protocols: Ethernet, Wireless Ethernet, Fiber Distributed Data Interconnect (FDDI), Attached Resource Computer Network (ARCNET), Synchronous Optical Network (SONET), Asynchronous Transfer Mode (ATM), and Token Ring (Col. 3, lines 30-35).

7. As per claim 4, Susnow teaches The TCP-aware target adapter as recited in claim 2, wherein said accelerated connection processor supports TCP/IP transactions with the plurality of clients by receiving/transmitting native transactions in accordance with said native network protocol (Col. 4, lines 30-54).

8. As per claim 5, Susnow teaches the TCP-aware target adapter as recited in claim 4, wherein each of a plurality of accelerated TCP/IP connections comprises:

a plurality of said remote direct memory access operations between a particular server and said target channel adapter to retrieve/provide particular transaction data from/to said particular server (Col. 4, lines 40-41); and

corresponding native transactions between said accelerated connection processor and a particular client to provide/retrieve said particular transaction data to/from said particular client (Col. 4, lines 30-54, wherein I/O and driver access to and from clients).

9. As per claim 6, Susnow does not explicitly teach said accelerated connection processor comprises:

a connection correlator, configured to associate TCP/IP connection parameters with a target work queue number for said each of a plurality of accelerated TCP/IP connections.

10. Cheriton teaches:

a connection correlator, configured to associate TCP/IP connection parameters with a target work queue number for said each of a plurality of accelerated TCP/IP connections (Col. 3, lines 38-45, lines 54-57; Col. 4, lines 37-44).

11. It would have been obvious to one of ordinary skill in this art at the time of invention was made to combine the teaching of Susnow and Cheriton because they both dealing with remote memory access systems. Furthermore, the teaching of Cheriton to allow a connection correlator, configured to associate TCP/IP connection parameters with a target work queue number for said each of a plurality of accelerated TCP/IP connections would decrease the complexity for Susnow's system by utilizing existing protocols to improve TCP/IP speed.

12. As per claim 7, Susnow does not explicitly teach the apparatus as recited in claim 6, wherein TCP/IP connection parameters comprise: source TCP port number, destination TCP port number, source IP address, and destination IP address.

13. Cheriton teaches

wherein TCP/IP connection parameters comprise: source TCP port number, destination TCP port number, source IP address, and destination IP address (Fig 1, source and destination TCP port, and IP address would be inherently taught in the TCP/IP connection).

14. It would have been obvious to one of ordinary skill in this art at the time of invention was made to combine the teaching of Susnow and Cheriton because they both dealing with remote memory access systems. Furthermore, the teaching of Cheriton to allow source TCP port number, destination TCP port number, source IP address, and destination IP address would decrease the complexity for Susnow's system by utilizing existing protocols to improve TCP/IP speed.

15. As per claim 8, Susnow teaches the TCP-aware target adapter as recited in claim 6, wherein said target work queue number corresponds to a host work queue number within a specific server (Col. 7, lines 40-55; Col. 8, lines 50-55, wherein synchronizing is a means to establish communications between remote queues of client and server, this is supported in rDMA between clients and servers, Col. 4, lines 40-41), said specific server being designated by said accelerated connection processor to support said each of a plurality of accelerated TCP/IP connections with a specific client (Col. 4, lines 30-55).

16. As per claim 9, Susnow teaches an apparatus in a server connected to an Infiniband fabric for implementing accelerated TCP/IP connections between server and clients (Col. 3, lines 47-53) the clients being connected to a TCP/IP network (Col. 6, lines 28-45, wherein the VI is an improvement of TCP/IP, VI contains transport level reliability functions, and is able to allow faster I/O communication between network devices, other words, VI interface is a scaled down version of TCP/IP protocol for improvement in speed and reduction of software overhead), the apparatus comprising:

an accelerated connection driver (Fig 3, item 330), configured to manage the accelerated TCP/IP connections, wherein said connection acceleration driver designates memory locations within server memory such that transaction data can be retrieved/provided via Infiniband remote direct memory access operations (Col. 4, lines 40-41); and

a host channel adapter (Fig 4, item 339, it should be noted that Host and Target channel adapter's

naming convention is direction specific, host transmits data to the receiver, host channel adapter have similar purpose as target channel adapter, they both interface the host to the infiniband network, this can be supported in Col. 3, lines 42-60), coupled to said connection acceleration driver, configured to execute Infiniband operations via the Infiniband fabric, and configured to execute direct memory access functions to retrieve/provide said transaction data responsive to said Infiniband remote direct memory access operations (Col. 4, lines 30-41; Col. 3, lines 47-55).

Susnow does not explicitly teach:

Whereby the TCP/IP connections are accelerated by offloading TCP/IP processing otherwise performed by the plurality of servers to retrieve/provide said transaction data.

In a similar system Cheriton teaches using RDMA in a TCP/IP framework (Col. 3, lines 39-57). Specifically, Cheriton discloses of the overhead caused by traditional memory copy operations (Col. 3, lines 27-31), and a method to overcome such deficiencies by using RDMA in order to improve performance. The offloading is equivalent to RDMA process wherein a remote device performs functionalities on server's behalf so server's resources are freed up. Therefore, it would have been obvious to the person ordinary skilled in the art at the time of the invention to combine teachings of Susnow and Cheriton and to have used RDMA to accelerate TCP/IP communications in Susnow's system for the performance gain achieved by using RDMA (Col. 3, lines 39-47).

17. As per claim 10, claim 10 is rejected for the same reasons as rejection to combination of claims 2 and 4 above.

18. As per claim 11, Susnow teaches the apparatus as recited in claim 9, wherein said connection acceleration driver comprises:

native queue logic (Col. 4, lines 1-13, wherein the host has its own memory/queue logic), configured to interpret a native network protocol corresponding to the clients, and configured to request/receive first

Infiniband operations having native TCP/IP transactions to/from the clients that are embedded within Infiniband packets (Col. 4, lines 30-54, wherein the communication system example uses infiniband network, with bi-directional communications in place);

accelerated queue logic, configured to request second Infiniband operations to establish the accelerated TCP/IP connections, said second Infiniband operations designating said memory locations (Col. 4, lines 30-35); and

a transport driver interface mux, coupled to said accelerated queue logic, configured to receive said memory locations from application programs, and configured to provide said memory locations to said accelerated queue logic (see for example, Col. 4, lines 40-45, wherein read and write operations along with other memory access management teaches this section; Col. 5, lines 20-30; Col. 7, lines 40-55).

19. As per claim 12, Susnow teaches the apparatus as recited in claim 11, wherein said transport driver interface mux (Fig 6, item 620) is coupled via a transport driver interface to a TCP/IP stack within the server (wherein the transport driver is access to infiniband fabric as show in item 339 of Fig 4, and Col. 4, lines 25-35).

20. As per claim 13-15, claims 13-15 are rejected for the same reasons as rejection to claims 6-8 above respectively.

21. As per claim 16, Susnow teaches an apparatus within a client-server environment for managing an accelerated TCP/IP connection between a server connected to an Infiniband fabric and a client connected to a TCP/IP network, the apparatus comprising:

a host driver, for providing a host work queue (Fig 4, item 333, 334) through which transaction data corresponding to the accelerated TCP/IP connection is transmitted/received via the Infiniband fabric (Col. 2, lines 55-60; Col. 3, lines 45-55); and

a TCP-aware target adapter (Fig 4, item 339), coupled to said host driver, for providing a target work

queue corresponding to said host work queue, and for executing a remote direct memory access operation to receive/transmit said transaction data via the Infiniband fabric (wherein the RDMA accesses are remote memory access, the memory in which the host system will access are the target host adapter's corresponding memory system, namely 333, 334 on Fig 4, the work queue stores rDMA processes that need to be carried out on the remote system, all the processes are stored within system memory prior to execution by the CPU, the memory system 333 and/or 334 provides a work buffer for the processes, see Col. 4, lines 1-25 and Col. 3, lines 45-65 for details).

Susnow does not explicitly teach:

Whereby the accelerated TCP/IP connection offloads TCP/IP processing otherwise performed by the server to receive/transmit said transaction data.

In a similar system Cheriton teaches using RDMA in a TCP/IP framework (Col. 3, lines 39-57). Specifically, Cheriton discloses of the overhead caused by traditional memory copy operations (Col. 3, lines 27-31), and a method to overcome such deficiencies by using RDMA in order to improve performance. The offloading is equivalent to RDMA process wherein a remote device performs functionalities on server's behalf so server's resources are freed up. Therefore, it would have been obvious to the person ordinary skilled in the art at the time of the invention to combine teachings of Susnow and Cheriton and to have used RDMA to accelerate TCP/IP communications in Susnow's system for the performance gain achieved by using RDMA (Col. 3, lines 39-47).

22. As per claim 17-19, claims 17-19 are rejected for the same reasons as rejection to claims 2-5 above respectively.

23. As per claims 20-21, claims 20-21 are rejected for the same reasons as rejection to claim 6 above.

24. As per claim 22, claim 22 is rejected for the same reasons as rejection to claim 7 above.

25. As per claim 27, Susnow teaches via the TCP-aware target adapter, generating native network transactions to transfer the data to/from clients (Col. 4, lines 30-55).

However, Susnow does not explicitly teach

a method for offloading server TCP/IP processing in a client-server environment comprising:

bypassing a TCP/IP stack otherwise employed in a server by utilizing remote direct memory access operations via an Infiniband fabric to directly access data from/to server memory, wherein the data is provided to/from a TCP-aware target adapter, the TCP-aware target adapter providing native network ports that connect to clients

In a similar system Cheriton teaches using RDMA in a TCP/IP framework (Col. 3, lines 39-57). Specifically, Cheriton discloses of the overhead caused by traditional memory copy operations (Col. 3, lines 27-31), and a method to overcome such deficiencies by using RDMA in order to improve performance. The offloading is equivalent to RDMA process wherein a remote device performs functionalities on server's behalf so server's resources are freed up. Therefore, it would have been obvious to the person ordinary skilled in the art at the time of the invention to combine teachings of Susnow and Cheriton and to have used RDMA to accelerate TCP/IP communications in Susnow's system for the performance gain achieved by using RDMA (Col. 3, lines 39-47).

26. As per claim 28, claim 28 are rejected for the same reasons as rejection to 6 above.

27. As per claim 29, claim 29 are rejected for the same reasons as rejection to 6 above.

28. As per claim 30, claim 30 is rejected for the same reasons as rejection to claim 1 and 11 above.

29. As per claim 31, claim 31 is rejected for the same reasons as rejection to claim 2 above.

30. As per claim 32, Susnow teaches the TCP-aware target adapter as recited in claim 31, wherein

said accelerated connection processor encapsulates outgoing TCP/IP transactions within Infiniband raw packets for transmission to the plurality of clients (wherein Susnow teaches native protocols existing on the server and client hosts, Col. 3, lines 30-35, furthermore, Susnow's invention deals with data communication on the Infiniband fabric, Col. 4, lines 55-57. Thus, in light of the above, a protocol transition/translation is inherently in place, furthermore, as data packet travel from one ISO layer to another, there is encapsulation occurring, since infiniband fabric is acting as a physical communications layer, any data packets coming from an upper layer would need to be encapsulated to be readily identifiable on the receiver side upon de-capsulation).

31. As per claim 33, claim 33 is rejected for the same reasons as rejection to claim 1 and 32 above.

32. As per claim 34, claim 34 is rejected for the same reasons as rejection to claim 6 above.

33. As per claim 35, claim 35 is rejected for the same reasons as rejection to claim 7 above.

34. As per claim 36, claim 36 is rejected for the same reasons as rejection to claim 16 above.

35. As per claim 37, claim 37 is rejected for the same reasons as rejection to claim 6 above. Examiner notes that the claim states 'unaccelerated', it should be noted that the infiniband fabric is what really accelerating the TCP/IP connections, this is realized by transferring TCP packets on the infinband network. Thus, claim 6 with combination of Susnow's system teaches this claim.

36. As per claim 38, claim 38 is rejected for the same reasons as rejection to claim 7 above.

37. As per claim 39, claim 39 is rejected for the same reasons as rejection to combination of claim 8 and 37 above respectively.

38. Claims 40-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Susnow et al.

(hereinafter Susnow), US 6,751,235, in view of Johnson, US 6,591,310.

39. As per claim 40, Susnow teaches an Infiniband-to-native protocol translation apparatus (wherein Susnow teaches native protocols existing on the server and client hosts, Col. 3, lines 30-35, furthermore, Susnow's invention deals with data communication on the Infiniband fabric, Col. 4, lines 55-57. Thus, in light of the above, a protocol transition/translation is inherently in place), for

routing TCP/IP transactions between a plurality of clients and a plurality of Infiniband devices, the plurality of Infiniband devices being accessed via an Infiniband fabric, the plurality of clients being accessed via a TCP/IP network (Fig 3), the Infiniband-to-native protocol translation apparatus comprising:

an unaccelerated connection processor (wherein the infiniband network is doing the acceleration, the end processors are not accelerated), configured to bridge (Fig 3, item 300) the TCP/IP transactions between the plurality of clients and the plurality of Infiniband devices by encapsulating/stripping the TCP transactionswithin/from Infiniband raw packets, said unaccelerated connection processor comprising (as data packet travel from one ISO layer to another, there is encapsulation occurring, since infiniband fabric is acting as a physical communications layer, any data packets coming from an upper layer i.e. TCP/IP would need to be encapsulated to be readily identifiable on the receiver side upon de-capsulation) :

a target channel adapter, coupled to said unaccelerated connection processor, configured to receive/transmit said Infiniband raw packets from/to the plurality of Infiniband devices (Col. 4, lines 30-52).

41. Susnow does not explicitly teach:

an unaccelerated connection correlator, for mapping native addresses to/from Infiniband local indentifiers and work queue numbers.

42. Johnson teaches:

an unaccelerated connection correlator, for mapping native addresses to/from Infiniband local indentifiers and work queue numbers (Col. 10, lines 10-15; Col. 6, line 47, wherein infiniband is acting as transmission medium, native addresses are mapped to queue, Col. 6, line 65 – Col. 7, line 5; local infiniband identifiers are inherently available in the teaching of Johnson. Message identifiers are available for SCSI transmission medium see for example, Col. 8, lines 45-60, Johnson further discloses there are plurality of message transport mediums, including infiniband. Thus, in event of utilizing infiniband for Johnson, 'Infiniband Initiator mode Context Reply' and 'Infiniband Target mode Context Reply' would be a part of the message header. It should be further noted that Susnow suggests this type of infiniband to regular address conversion, see for example, Col. 6, lines 17-25 of Susnow. Johnson specifically discloses such mapping between local identifiers and queue numbers exist within the messages see Col. 6, lines 60 – Col. 7, line 5).

43. It would have been obvious to one of ordinary skill in this art at the time of invention was made to combine the teaching of Susnow and Johnson because they both dealing improving system I/O speeds. Furthermore, the teaching of Johnson to allow
an unaccelerated connection correlator, for mapping native addresses to/from Infiniband local indentifiers and work queue numbers would improve the latency and communication costs for Susnow's system by quickly identifying the message contents (Col. 8, lines 35-40).

44. As per claim 41, Susnow does not explicitly teach the infiniband-to-native protocol translation apparatus as recited in claim 40, wherein said native address comprise MAC address.

45. Johnson teaches wherein said native address comprise MAC address (Col. 6, lines 66-67, wherein the MAC address is the physical address), it would have been obvious to combine teaching of Susnow and Johnson at least for the same reasons as rejection to claim 40 above.

46. As per claim 42, Susnow does not explicitly teach the Infiniband-to-native protocol translation apparatus as recited in claim 40, wherein said native addresses comprise IP addresses.

47. Johnson teaches wherein said native addresses comprise IP addresses (Col. 6, lines 66-67, wherein the IP address is the logical address), it would have been obvious to combine teaching of Susnow and Johnson at least for the same reasons as rejection to claim 40 above.

48. As per claim 43, Susnow teaches the Infiniband-to-native protocol translation apparatus as recited in claim 40, wherein said Infiniband local identifiers comprise source local identifier, destination local identifier, and work queue number (wherein the local identifiers of Infiniband are identified by the memory write and read queues, as disclosed in Col. 4, lines 30-55, RMA calls are mapped to queues locally based on client and server transactions. This point is further disclosed in Col. 8, lines 50-55 and Col. 9, lines 50-55).

49. As per claim 44, Susnow teaches the Infiniband-to-native protocol translation apparatus as recited in claim 43, wherein said Infiniband local identifiers map said TCP/IP transactions between a particular client and a server connected to an Infiniband fabric (Fig 3, items 340, 300, 360).

50. As per claim 45, Susnow teaches the Infiniband-to-native protocol translation apparatus as recited in claim 43, wherein said Infiniband local identifiers map said TCP/IP transactions between a particular client and a TCP-aware target adapter connected to an Infiniband fabric (Fig 3, items 340, 300, 360).

51. Claims 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Susnow et al. (hereinafter Susnow), US 6,751,235, in view of "Virtual Interface (VI) Architecture Overview", Pathikonda et al., 1998 (hereinafter Pathikonda) and further in view of Cheriton et al. (hereinafter

Cheriton), US 6,675,200.

52. As per claim 23, Susnow does not explicitly teach a method for accelerating TCP/IP connections in a client server environment having clients that are connected to a TCP/IP network and server that are connected to an Infiniband fabric, the method comprising:

mapping TCP/IP connection parameters (parameters under VI architecture, Col. 4, lines 55-67) for accelerated connections to corresponding host and target work queue pairs (although the mapping aspect is obviously done between host and target systems's queues, since the host system is calling rDMA access and queue management, the corresponding mapping must be known in advance because the target system need to know where to return the rDMA result once the rDMA is completed remotely); and

In a similar system, Pathikonda teaches the queue in VIA, in accordance with Virtual Interface Architecture Version 1.0 Specification, there are work queues on the host, see for example, pg 22 for additional details.

It would have been obvious to the person ordinary skill in the art at the time of the invention to combine teachings of Susnow and Pathikonda because mapping of connection parameters between two queue pairs is taught in Virtual Interface Architecture version 1.0 of Pathikonda, would lead to mapping of TCP/IP parameters for accelerated connections to corresponding host and target work queue pairs of Susnow, and would enhance the performance of Susnow via rDMA processes.

Susnow does not explicitly teach:

offloading TCP/IP processing otherwise performed by the servers by executing Infiniband remote direct memory access operations to retrieve/transmit data associated with the accelerated connections from/to memory within the servers.

In a similar system Cheriton teaches using RDMA in a TCP/IP framework (Col. 3, lines 39-57).

Specifically, Cheriton discloses of the overhead caused by traditional memory copy operations (Col. 3,

lines 27-31), and a method to overcome such deficiencies by using RDMA in order to improve performance. The offloading is equivalent to RDMA process wherein a remote device performs functionalities on server's behalf so server's resources are freed up. Therefore, it would have been obvious to the person ordinary skilled in the art at the time of the invention to combine teachings of Susnow and Cheriton and to have used RDMA to accelerate TCP/IP communications in Susnow's system for the performance gain achieved by using RDMA (Col. 3, lines 39-47).

53. As per claim 26, Susnow teaches the method as recited in claim 23, further comprising: generating TCP/IP transactions in a native network protocol to provide the data to clients (Col. 3, lines 30-35, wherein each native protocol has ports between transmitter and receiver, Col. 10, lines 25-30).

54. As per claim 24, Susnow teaches the method as recited in claim 23, wherein said mapping comprises:

establishing Infiniband connections between the servers and a TCP-aware target adapter (Fig 3, links between 340, 300, 360).

55. Susnow does not explicitly teach:

intercepting the TCP/IP connection parameters from requests to send/receive data from/to the servers.

56. Cheriton teaches:

intercepting the TCP/IP connection parameters from requests to send/receive data from/to the servers (see for example, Col. 3, lines 38-45).

57. It would have been obvious to one of ordinary skill in this art at the time of invention was made to combine the teaching of Susnow and Cheriton because they both dealing with remote memory access systems. Furthermore, the teaching of Cheriton to allow intercepting the TCP/IP connection parameters from requests to send/receive data from/to the servers would decrease the complexity for Susnow's system by utilizing existing protocols to improve TCP/IP speed.

58. As per claim 25, Susnow teaches the method as recited in claim 24, wherein said executing comprises:

providing the TCP-aware target adapter with memory locations within the servers for transmission/reception of the data (Col. 4, lines 1-13);

from the TCP-aware target adapter, transmitting the remote direct memory access operations to the servers (Col. 4, lines 40-41); and

from the servers, providing remote direct memory access responses (Col. 4, lines 40-41).

Response to Arguments

59. In the remark, the Applicant argued in substance that Susnow fails to disclose or suggest "acceleration of a TCP/IP connection by prescribing remote direct memory access operations, wherein TCP/IP transactions are accelerated by offloading TCP/IP processing otherwise performed by the server to retrieve/provide transaction data", It should be noted that Susnow is no longer referenced to teach this limitation, though Susnow does suggest rDMA processes, a more detailed teaching was suggested by Cheriton, US 6,675,200.

In a similar system Cheriton teaches using RDMA in a TCP/IP framework (Col. 3, lines 39-57). Specifically, Cheriton discloses of the overhead caused by traditional memory copy operations (Col. 3, lines 27-31), and a method to overcome such deficiencies by using RDMA in order to improve

performance. The offloading is equivalent to RDMA process wherein a remote device performs functionalities on server's behalf so server's resources are freed up. Therefore, it would have been obvious to the person ordinary skilled in the art at the time of the invention to combine teachings of Susnow and Cheriton and to have used RDMA to accelerate TCP/IP communications in Susnow's system for the performance gain achieved by using RDMA (Col. 3, lines 39-47).

60. In the remark, the Applicant argued in substance that Susnow fails to disclose or suggest "a work queue, nor does he suggest any means whatsoever of accelerating a TCP/IP connection by executing a RDMA operation to receive/transmit transaction data"

In response to Applicant'a amendments, Pathiknoda teaches the queue in VIA, in accordance with Virtual Interface Architecture Version 1.0 Specification, there are work queues on the host, see for example, "Virtual Interface (VI), Architecture Overview", Pathikonda et al. 1998, pg 22 for additional details.

In a similar system Cheriton teaches using RDMA in a TCP/IP framework. Specifically, Cheriton discloses of the overhead caused by traditional memory copy operations (Col. 3, lines 27-31), and a method to overcome such deficiencies by using RDMA in order to improve performance. The offloading is equivalent to RDMA process wherein a remote device performs functionalities on server's behalf so server's resources are freed up. Therefore, it would have been obvious to the person ordinary skilled in the art to have used RDMA to accelerate TCP/IP communications for the performance gain achieved by using RDMA (Col. 3, lines 39-47). Thus, Susnow in view of the two above references discloses this section.

61. In the remark, the Applicant argued in substance that Susnow is silent with regard to bypassing a TCP/IP stack otherwise employed in a server by utilizing remote direct memory access operations to directly access data from/to server memory. Furthermore, Susnow does not even identify processing in a server TCP/IP stack as a problem needing attention.

In response to Applicant's amendments, Susnow is no longer relied upon for bypassing aspect.
In a similar system Cheriton teaches using RDMA in a TCP/IP framework (Col. 3, lines 39-57). Specifically, Cheriton discloses of the overhead caused by traditional memory copy operations (Col. 3, lines 27-31), and a method to overcome such deficiencies by using RDMA in order to improve performance. The offloading is equivalent to RDMA process wherein a remote device performs functionalities on server's behalf so server's resources are freed up. Therefore, it would have been obvious to the person ordinary skilled in the art at the time of the invention to combine teachings of Susnow and Cheriton and to have used RDMA to accelerate TCP/IP communications in Susnow's system for the performance gain achieved by using RDMA (Col. 3, lines 39-47).
Additionally, Susnow teaches an extension of TCP/IP called VIA interface architecture, this architecture is disclosed numerously in the forgoing office action and with the IDS, thus the examiner will not further elaborate the architecture of VIA.

62. In the remark, the Applicant argued in substance that Susnow is silent in regards to accelerating the TCP/IP connection.
In response to Applicant's arguments, the VIA architecture is a related version of TCP, the examiner established that as shown above. The VIA connections are accelerated through the infiniband fabric as they travel across the fabric, furthermore, rDMA processes themselves will accelerate the VIA connections as well as processes normally done locally is allocated to be processed remotely, the performance advantage of this method results in increased VIA performance.

63. In the remark, the Applicant argued in substance that Susnow does not provide any motivation whatsoever that would lead one skilled in the art to even consider accelerating TCP/IP connection, and much less so to accomplish such acceleration by performing remote direct memory access operations. It was established previously that VIA architecture is an alternate version of TCP/IP, the motivation to

accelerated is already within Susnow, though not clearly pointed out, evidence of such performance advantage gain can be found in using rDMA processes between the host and target channel adapters (Col. 4, lines 40-50). Moreover, additional motivation is shown in Cheriton.

Specifically, Cheriton discloses of the overhead caused by traditional memory copy operations (Col. 3, lines 27-31), and a method to overcome such deficiencies by using RDMA in order to improve performance. The offloading is equivalent to RDMA process wherein a remote device performs functionalities on server's behalf so server's resources are freed up. Therefore, it would have been obvious to the person ordinary skilled in the art at the time of the invention to combine teachings of Susnow and Cheriton and to have used RDMA to accelerate TCP/IP communications in Susnow's system for the performance gain achieved by using RDMA (Col. 3, lines 39-47).

64. In the remark, the Applicant argued in substance that Cheriton fails to disclose or suggest "a connection correlator that is configured to associate TCP/IP connection parameters with a target work queue number for each of a plurality of accelerated TCP/IP connections"

In response to Applicant's amendments, Cheriton teaches in Col. 3, lines 38-45, lines 54-57; Col. 4, lines 37-44, wherein the queue are the memory copying targeted through RDMA operation i.e. source to destination, hence there is the association between the memories being copied and the TCP/IP connections, furthermore, RDMA operation accelerates TCP/IP connection as taught in Cheriton.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reined of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following patents and publications are cited to further show the state of the art with respect to "Infiniband work queue to TCP/IP Translation"

i.	US 6243787	Kagan et al.
ii.	US 6594329	Susnow et al.
iii.	US 6661773	Pelissier et al.
iv.	US 6690757	Bunton et al.
v.	US 6591310	Johnson
vi.	US 6535518	Hu et al.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chad Zhong whose telephone number is (571)272-3946. The examiner can normally be reached on M-F 7:15 to 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, BURGESS, GLENTON B can be reached on (571)272-3949. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained

from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CZ

July 20, 2005

N. Elhady